REMARKS

Applicants thank the Examiner for the thorough consideration given the present application. Claims 21-40 are pending in the present application. Claims 27-40 are new. Claims 21-26 have been amended. Claims 21 and 24 are independent claims. The Examiner is respectfully requested to reconsider the outstanding rejections in view of the above amendments and the following remarks.

Please note that the means-plus-function language have been removed from apparatus claims 21-23 to reflect Applicants' intent not to invoke the provisions of 35 U.S.C. § 112, 6th paragraph.

Prior Art Rejections

Claims 21, 22, 24, and 25 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,721,003 to Tsuruoka et al. (hereafter "Tsuruoka"). Further, claims 23 and 25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuruoka. These rejections, insofar as they pertain to the presently pending claims, are respectfully traversed.

Applicants point out that the invention as recited in amended claims 21 and 24 has the following features (a) and (b), namely:

(a) the provision of the low-pass filters corresponding to the K-th spectral characteristic and the L-th spectral characteristic; and

(b) the performance of regression analysis using the pixels signals or outputs of the low-pass filter corresponding to the K-th spectral characteristic as an explanatory variable and the pixel signals or outputs of the low-pass filter corresponding to the L-th spectral characteristic as a purpose variable, to calculate a regression line according to the following formula (1): $y = a \cdot x + b$.

As a result, the claimed invention can achieve interpolation properly, even in the vicinity of color boundaries and black or white smears. Also, the claimed invention can greatly mitigate false colors occurring near color boundaries.

To achieve interpolation according to the claimed invention, the above formula (1) is used to determine pixel signal y of the L-th spectral characteristic from the pixel signal x of the K-th spectral characteristic. The regression line shown by formula (1) is obtained by the least squares method using the pixel signal x as the explanatory variable and the pixel signal y as the purpose variable. As such, the slope 'a' and the intercept 'b' of the regression line are obtained by using the signals (pixel signal or low-pass filter output) of different spectral characteristics (the K-th spectral characteristic and the L-th spectral characteristic) as the explanatory variable x(i) and the purpose variable y(i).

If both of the pixel signals of the K-th spectral characteristic and the pixel signal of the L-th spectral characteristic are available, they could be used for determining the slope 'a' and the intercept 'b.' Before interpolation, however, at least one of the pixel signal of the K-th spectral characteristic and the pixel signal of the L-th spectral characteristic, for a particular pixel position, will be unknown. Thus, the claimed invention, performs low-pass filtering the pixels signals in the vicinity of each pixel, the results of which can be used for at least one of the explanatory variable or the purpose variable.

As has been explained above, the regression analysis of the claimed invention cannot be achieved without obtaining a signal for both the K-th spectral characteristic and the L-th spectral signal for each pixel position. If the pixel signal output by the imaging device (in its digitized form) is not available, a signal such as that obtained by low-pass filtering can be used to apply the claimed regression analysis.

Claimed Features Distinguish over Tsuruoka:

Applicants respectfully submit that Tsuruoka fails to teach or suggest the claim features (a) and (b) discussed above. In particular, the formula (9) in Tsuruoka is obtained by a different method than the formula (1) in the claimed invention. Specifically, in order to obtain the line in Tsuruoka's formula (9), it is not necessary to use the signals of both colors i and j from the same pixel position.

In col. 9, lines 53-67, Tsuruoka discloses the following with regard to formula (9):

> DEV_S_i represents the standard deviation of signals S_i;
> DEV_S_j represents the standard deviation of the signals S_j;
> AV_S_i represents the average of the signals S_i;
> AV_S_j represents the average of the signals S_j; and
> i, j = R, G or B, and $j \neq i$.

Thus, Tsuruoka formula (9) uses the standard deviation DEV_S_i and the average AV_S_i for a certain color i, and the standard deviation DEV_S_j and the average AV_S_j for another color j, and calculates Si according to the formula (9). It should be noted that DEV_S_i, AV_S_i are obtained only from the values of the signals of a single color i. Similarly, DEV_S_j, AV_S_j are obtained only from the values of the signals of another single color j.

In the state before the interpolation, as illustrated in Fig. 6(b) in Tsuruoka, the signal value of only one of a plurality of colors is known, for each pixel, and the signal value of other colors are unknown. The average and the standard deviation of the signals of the color i are obtained from the signals of the pixels at which the signals of the color i are known, and the average and the standard deviation of the signals of the color j are obtained from the signals of the pixels at which the signals of the color j are known.

In this way, formula (9) in Tsuruoka uses parameters which can be obtained without the signals of both colors i and j for each pixel, i.e., slope (DEV_S_i/DEV_S_j), and intercept {AV_S_i -

$AV\_S_j * (DEV\_S_i/DEV\_S_j)\}$. As such, it is clear that Tsuruoka utilizes a different regression line for calculating the interpolated value than the claimed invention. Furthermore, because of the difference in the manner of calculation between Tsuruoka and the claimed invention, the results of the interpolation can be different in certain situations.

Since Tsuruoka fails to perform the regression analysis of feature (b) in the presently claimed invention, and thus fails to teach or suggest utilizing the regression line of the claimed invention to interpolate pixel signal values, Tsuruoka neither anticipates nor renders obvious independent claims 21 and 24. At least for this reason, Applicants submit that independent claims 21 and 24 are in condition for allowance. Accordingly, claims 22, 23, 25, and 26 are allowable at least by virtue of their dependency on claims 21 and 24. Therefore, the Examiner is respectfully requested to reconsider and withdraw the rejections under §§ 102 and 103.

Conclusion

Since the remaining references cited by the Examiner have not been utilized to reject the claims, but to merely show the state of the art, no comment need be made with respect thereto.

In view of the above amendments and remarks, the Examiner is respectfully requested to reconsider the outstanding rejections and issue a Notice of Allowance in the present application.

Should the Examiner believe that any outstanding matters remain in the present application, the Examiner is respectfully requested to contact Jason W. Rhodes (Reg. No. 47,305) at the telephone number of the undersigned to discuss the present application in an effort to expedite prosecution.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

By _____ #47,305
for D. Richard Anderson
Registration No.: 40,439
BIRCH, STEWART, KOLASCH & BIRCH, LLP
8110 Gatehouse Road
Suite 100 East
P.O. Box 747
Falls Church, Virginia 22040-0747
(703) 205-8000
Attorney for Applicant